(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 144 375 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.03.2017 Bulletin 2017/12

(21) Application number: **15185687.9**

(22) Date of filing: **17.09.2015**

(51) Int Cl.:
C11D 3/37 *(2006.01)*
C11D 17/00 *(2006.01)*
C11D 17/04 *(2006.01)*
C11D 3/20 *(2006.01)*
C11D 3/00 *(2006.01)*
C11D 17/06 *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

(71) Applicant: **The Procter & Gamble Company**
Cincinnati, OH 45202 (US)

(72) Inventors:
- **Kataky, Ritu**
  Durham, NH1 3LE (GB)
- **Ntola, Chifundo Nyasha Michelle**
  Durham, DH1 3LE (GB)
- **Vaccaro, Mauro**
  Newcastle upon Tyne, NE12 9TS (GB)
- **Brooker, Anju Deepali Massey**
  Newcastle upon Tyne, NE12 9TS (GB)
- **Cuthbertson, Melissa**
  Newcastle upon Tyne, NE12 9TS (GB)
- **Walker, Stephen John**
  Newcastle upon Tyne, NE12 9TS (GB)

(74) Representative: **Howard, Phillip Jan**
Procter & Gamble
Technical Centres Limited
Whitley Road
Longbenton
Newcastle upon Tyne NE12 9TS (GB)

(54) A PROCESS FOR MAKING A DETERGENT COMPOSITION

(57) The present invention relates to a detergent composition comprising a core-shell particle, wherein the core-shell particle comprises a core, wherein the core comprises at least 50% by weight of the core of a mixture of silicone and fatty acid, wherein the core-shell particle comprise a shell, wherein the shell comprises at least 66% by weight of the shell of a polymer.

EP 3 144 375 A1

Printed by Jouve, 75001 PARIS (FR)

Description

FIELD OF THE INVENTION

[0001] The present invention relates to detergent compositions comprising a core-shell particle. The core shell particle comprises silicone and fatty acid and provides a detergent composition that exhibits good stability profile, both physical stability and chemical stability.

BACKGROUND OF THE INVENTION

[0002] Hydrophobic oily benefit agents such as silicone, are incorporated into a variety of compositions, such as detergent products. In some applications, such as laundry treatment, it is desirable for these hydrophobic oily benefit agents to be delivered onto the surface to be treated during the treatment process. However, hydrophobic oily benefit agents are typically incorporated into these consumer goods products at very low levels, and the efficiency of silicone deposition onto the treated surface during the treatment process is also low. Compatibility with other detergent ingredients is also a problem, especially in highly alkaline environments and/or in highly aqueous environments.

[0003] Incorporating hydrophobic oily benefit agents such as silicones into detergent compositions is difficult. Silicones are highly viscous materials and difficult to handle and incorporate. Furthermore, the compatibility profile of these materials with other ingredients, such as detergent ingredients needs to be improved, especially in highly alkaline environments and/or highly aqueous environments.

[0004] The Inventors have found that a detergent compostion according to the present invention overcomes these problems.

[0005] EP1479378 relates to a personal product compositions comprising structured benefit agent premix or delivery vehicle and providing enhanced effect of hydrophobic material separate from the structured benefit agent. This invention comprises a structured premix or "delivery vehicle" composition designed as a carrier to enhance the benefit (e.g., via enhanced deposition or other mechanism) of a separate hydrophobic benefit agent(s) (for example, perfumes, skin lightening agents, etc.), from personal product compositions (e.g., liquid and bar cleansers, creams, emulsions, hair composition, deodorant etc.). When the structured benefit agent composition is separately prepared and combined with the personal product composition (preferably while structured, premix composition is still in molten or liquid state), the personal product composition with structured benefit agent carrier provides enhanced deposition of the structured benefit agent and enhanced effect of the separate hydrophobic benefit agent(s) in or on the carrier or in the presence of structured benefit agent carrier.

[0006] WO2012089474 relates to a method for production of an emulsion. This invention has as an objective to provide a new emulsification method, which can produce concentrated water-continuous emulsion containing lipophilic compounds in a dispersed phase, with a very fine dispersed phase droplet size less than a micron, and a narrow size distribution of the dispersed phase. This objective has been met by a method wherein a water-continuous emulsion is made using a Controlled Deformation Dynamic Mixer or a Cavity Transfer Mixer.

[0007] WO2011116962 relates to a process of treatment of fibers and/or textile materials. This invention covers a process of treatment of textile materials containing microcapsules of active ingredients, the fibers and/or textile materials resulting from this process and their cosmetic or pharmaceutical use and/or their use as a repellent.

SUMMARY OF THE INVENTION

[0008] The present invention relates to a detergent composition comprising a core-shell particle, wherein the core-shell particle comprises a core, wherein the core comprises at least 50% by weight of the core of a mixture of silicone and fatty acid, wherein the core-shell particle comprise a shell, wherein the shell comprises at least 66% by weight of the shell of a polymer.

DETAILED DESCRIPTION OF THE INVENTION

[0009] Detergent composition: The detergent composition comprises a core-shell particle, wherein the core-shell particle comprises a core, wherein the core comprises at least 50% by weight of the core of a mixture of silicone and fatty amphiphile, wherein the core-shell particle comprise a shell, wherein the shell comprises at least 66% by weight of the shell of a polymer. It may be preferred that the core-shell particle comprises from 90wt% to 98wt% by weight of the particle of core and from 2wt% to 10wt% by weight of the particle of shell.

[0010] Preferably, the composition comprises the weight ratio of fatty amphiphile to silicone present in the core in the range of from 5:1 to 15:1.

Preferably, the composition is a core-shell particle which comprises at least 10% by weight of the core of detersive surfactant.

[0011] Typically, the detergent composition comprises other ingredients. These detergent ingredients are described in more detail below.

[0012] The composition may be a laundry detergent powder. Typcially, the laundry detergent powder comprises from 3wt% to 30wt% core-shell particle and from 33wt% to 97wt% detergent particle, and optionally wherein the detergent particle comprises a polymer which has the same chemical structure as the polymer comprised in the shell of the core-shell particle.

[0013] The composition may be a liquid laundry detergent composition. Typically, the liquid laundry detergent composition comprises from 3wt% to 10wt% core-shell particle and from 90wt% to 97wt% liquid detergent matrix, wherein the core-shell particle is suspended within a continuous phase of liquid detergent matrix, and wherein the liquid detergent matrix comprises at least 1% by weight of the liquid detergent matrix of a polymer which has the same chemical structure as the polymer comprised in the shell of the core-shell particle, and optionally wherein the liquid detergent matrix comprises less than 30% by weight of the liquid detergent matrix of water.

[0014] The composition may be a water-soluble unit dose laundry detergent pouch.

[0015] Preferably, the laundry detergent pouch comprising at least two separate compartments, wherein the first compartment comprises the core-shell particle, and wherein the first compartment has a pH in the range of from 3.0 to 7.0, and wherein the second compartment comprises a detergent ingredient, and wherein the second compartment has a pH in the range of from greater than 7.0 to 12.0.

[0016] Preferably, the first compartment has a pH in the range of from 4.0 to 6.0, and wherein the second compartment has a pH in the range of from greater than 7.0 to 11.0.

[0017] Preferably, the first compartment comprises from 15% to 25% by weight of the core surfactant and from 2% to 5% of the polymer present in the first compartment, of the core-shell particle, and wherein the second compartment comprises from 15% to 35% of surfactant, from 50% to 70% of fatty amphiphile and polymer coating from 2% to 10% by weight of ingredients present in the second compartment.

[0018] **Core-shell particle:** The core-shell particle comprises a core, wherein the core comprises at least 50% by weight of the core of a mixture of silicone and fatty amphiphile, wherein the core-shell particle comprise a shell, wherein the shell comprises at least 66% by weight of the shell of a polymer. It may be preferred for the core-shell particle to comprise from 90wt% to 98wt% by weight of the particle of core and from 2wt% to 10wt% by weight of the particle of shell. Preferably, the weight ratio of fatty acid to silicone present in the core is in the range of from 5:1 to 15:1.

[0019] Preferably, the core-shell particle comprises at least 10% by weight of the core of detersive surfactant. Preferably, the detersive surfactant is selected from alkyl benzene sulphonate, alkyl alkoxylated alcohol, alkyl alkoxylated sulphate, polyoxyethylene sorbitan monooleate and any combination thereof. More preferably, the detersive surfactant is a C_{12}-C_{16} alkyl ethoxylated alcohol having an average degree of ethoxylation of from 3 to 7.

[0020] Preferably, the core comprises at least 5% by weight of the core of perfume.

[0021] **Silicone:** Suitable silicones are selected from the group consisting of cyclic silicones, polydimethylsiloxanes, aminosilicones, cationic silicones, silicone polyethers, silicone resins, silicone urethanes, and mixtures thereof.

[0022] A preferred silicone is a polydialkylsilicone, alternatively a polydimethyl silicone (polydimethyl siloxane or "PDMS"), or a derivative thereof.

[0023] Preferably, the silicone has a viscosity at a temperature of 25°C and a shear rate of $1000s^{-1}$ in the range of from 10Pa s to 100Pa s. Without wishing to be bound by theory, increasing the viscosity of the silicone improves the deposition of the perfume onto the treated surface. However, without wishing to be bound by theory, if the viscosity is too high, it is difficult to process and form the Detergent composition. A preferred silicone is AK 60000 from Wacker, Munich, Germany

[0024] Other suitable silicones are selected from an aminofunctional silicone, amino-polyether silicone, alkyloxylated silicone, cationic silicone, ethoxylated silicone, propoxylated silicone, ethoxylated/propoxylated silicone, quaternary silicone, or combinations thereof.

[0025] Suitable silicones are selected from random or blocky organosilicone polymers having the following formula:

$$[R_1R_2R_3SiO_{1/2}]_{(j+2)}[(R_4Si(X\text{-}Z)O_{2/2}]_k[R_4R_4SiO_{2/2}]_m[R_4SiO_{3/2}]_j$$

wherein:

j is an integer from 0 to about 98; in one aspect j is an integer from 0 to about 48; in one aspect, j is 0;

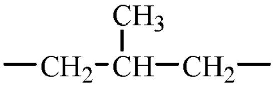
k is an integer from 0 to about 200, in one aspect k is an integer from 0 to about 50; when k = 0, at least one of R_1, R_2 or R_3 is -X-Z;

m is an integer from 4 to about 5,000; in one aspect m is an integer from about 10 to about 4,000; in another aspect m is an integer from about 50 to about 2,000;

R_1, R_2 and R_3 are each independently selected from the group consisting of H, OH, C_1-C_{32} alkyl, C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl, C_6-C_{32} alkylaryl, C_6-C_{32} substituted alkylaryl, C_1-C_{32} alkoxy, C_1-C_{32} substituted alkoxy and X-Z;

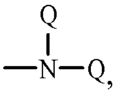
each R_4 is independently selected from the group consisting of H, OH, C_1-C_{32} alkyl, C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl, C_6-C_{32} alkylaryl, C_6-C_{32} substituted alkylaryl, C_1-C_{32} alkoxy and C_1-C_{32} substituted alkoxy;

each X in said alkyl siloxane polymer comprises a substituted or unsubsitituted divalent alkylene radical comprising 2-12 carbon atoms, in one aspect each divalent alkylene radical is independently selected from the group consisting of $-(CH_2)_s-$ wherein s is an integer from about 2 to about 8, from about 2 to about 4; in one aspect, each X in said alkyl siloxane polymer comprises a substituted divalent alkylene radical selected from the group consisting of: $-CH_2-CH(OH)-CH_2-$; $-CH_2-CH_2-$
$CH(OH)-$; and

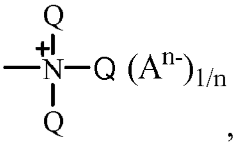


$$-CH_2-\overset{\displaystyle CH_3}{\overset{|}{C}H}-CH_2- ;$$

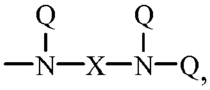
each Z is selected independently from the group consisting of



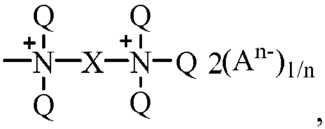
$$-\overset{\displaystyle Q}{\overset{|}{N}}-Q,$$



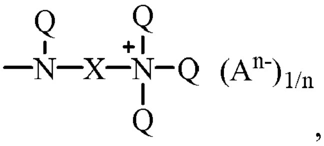
$$-\overset{\displaystyle Q}{\underset{\displaystyle Q}{\overset{+|}{\underset{|}{N}}}}-Q\ (A^{n-})_{1/n} ,$$



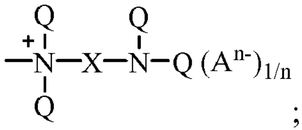
$$-\overset{\displaystyle Q}{\overset{|}{N}}-X-\overset{\displaystyle Q}{\overset{|}{N}}-Q,$$



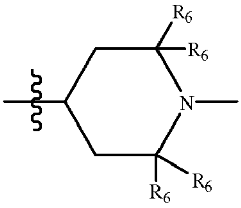
$$-\overset{\displaystyle Q}{\underset{\displaystyle Q}{\overset{+|}{\underset{|}{N}}}}-X-\overset{\displaystyle Q}{\underset{\displaystyle Q}{\overset{+|}{\underset{|}{N}}}}-Q\ 2(A^{n-})_{1/n} ,$$



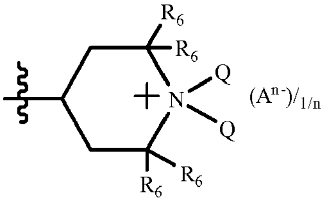
$$-\overset{\displaystyle Q}{\overset{|}{N}}-X-\overset{\displaystyle Q}{\underset{\displaystyle Q}{\overset{+|}{\underset{|}{N}}}}-Q\ (A^{n-})_{1/n} ,$$



$$-\overset{\displaystyle Q}{\underset{\displaystyle Q}{\overset{+|}{\underset{|}{N}}}}-X-\overset{\displaystyle Q}{\overset{|}{N}}-Q\ (A^{n-})_{1/n} ;$$

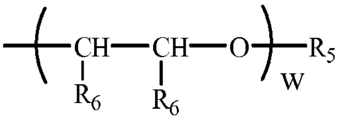


and

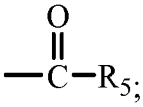


with the proviso that when Z is a quat, Q cannot be an amide, imine, or urea moiety and if Q is an amide, imine, or urea moiety, then any additional Q bonded to the same nitrogen as said amide, imine, or urea moiety must be H or a C_1-C_6 alkyl, in one aspect, said additional Q is H;

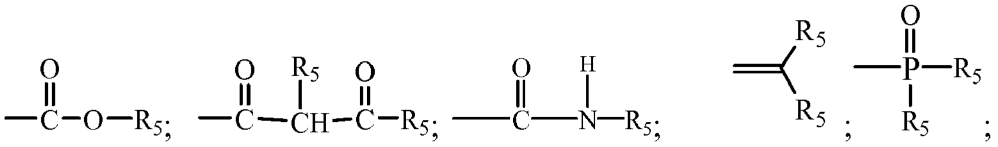
for Z A^{n-} is a suitable charge balancing anion. In one aspect A^{n-} is selected from the group consisting of Cl^-, Br^-, I^-, methylsulfate, toluene sulfonate, carboxylate and phosphate ; and at least one Q in said organosilicone is independently selected from
$-CH_2-CH(OH)-CH_2-R_5$;



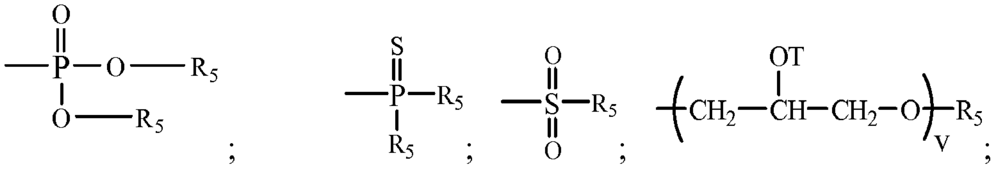
$$-\left(\underset{\displaystyle R_6}{\underset{|}{C}H}-\underset{\displaystyle R_6}{\underset{|}{C}H}-O\right)_w-R_5 ;$$



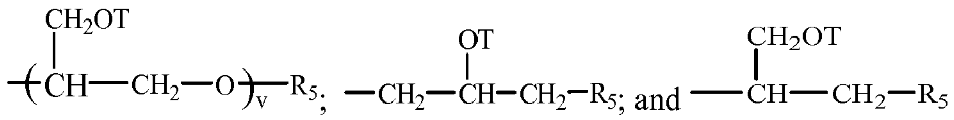
$$-\overset{\displaystyle O}{\overset{\|}{C}}-R_5;$$



$$-\overset{\overset{O}{\|}}{C}-O-R_5;\quad -\overset{\overset{O}{\|}}{C}-\overset{\overset{R_5}{|}}{CH}-\overset{\overset{O}{\|}}{C}-R_5;\quad -\overset{\overset{O}{\|}}{C}-\overset{\overset{H}{|}}{N}-R_5;\quad =C\begin{matrix}R_5\\R_5\end{matrix};\quad -\overset{\overset{O}{\|}}{\underset{\underset{R_5}{|}}{P}}-R_5;$$

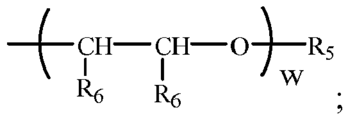


$$-\overset{\overset{O}{\|}}{\underset{\underset{O-R_5}{|}}{P}}-O-R_5;\quad -\overset{\overset{S}{\|}}{\underset{\underset{R_5}{|}}{P}}-R_5;\quad -\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-R_5;\quad \left(CH_2-\overset{\overset{OT}{|}}{CH}-CH_2-O\right)_v-R_5;$$

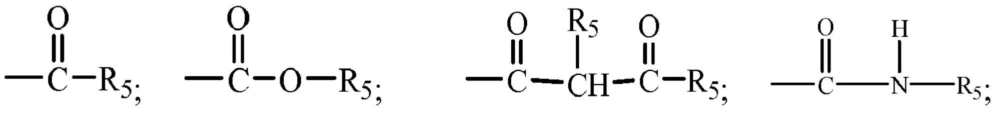


$$\left(\overset{\overset{CH_2OT}{|}}{CH}-CH_2-O\right)_v-R_5;\quad -CH_2-\overset{\overset{OT}{|}}{CH}-CH_2-R_5;\ \text{and}\ -\overset{\overset{CH_2OT}{|}}{CH}-CH_2-R_5$$

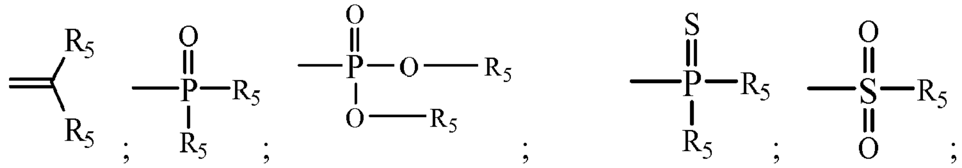
each additional Q in said organosilicone is independently selected from the group comprising of H, C_1-C_{32} alkyl, C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl, C_6-C_{32} alkylaryl, C_6-C_{32} substituted alkylaryl, -CH_2-CH(OH)-CH_2-R_5;



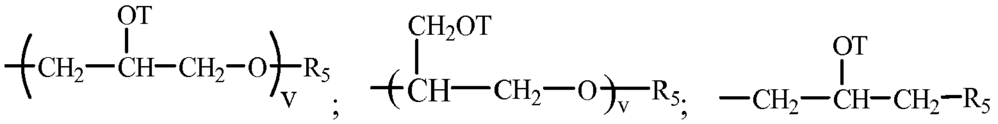
$$\left(\underset{\underset{R_6}{|}}{CH}-\underset{\underset{R_6}{|}}{CH}-O\right)_w-R_5;$$



$$-\overset{\overset{O}{\|}}{C}-R_5;\quad -\overset{\overset{O}{\|}}{C}-O-R_5;\quad -\overset{\overset{O}{\|}}{C}-\overset{\overset{R_5}{|}}{CH}-\overset{\overset{O}{\|}}{C}-R_5;\quad -\overset{\overset{O}{\|}}{C}-\overset{\overset{H}{|}}{N}-R_5;$$

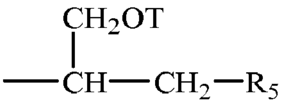


$$=C\begin{matrix}R_5\\R_5\end{matrix};\quad -\overset{\overset{O}{\|}}{\underset{\underset{R_5}{|}}{P}}-R_5;\quad -\overset{\overset{O}{\|}}{\underset{\underset{O-R_5}{|}}{P}}-O-R_5;\quad -\overset{\overset{S}{\|}}{\underset{\underset{R_5}{|}}{P}}-R_5;\quad -\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-R_5;$$



$$\left(CH_2-\overset{\overset{OT}{|}}{CH}-CH_2-O\right)_v-R_5;\quad \left(\overset{\overset{CH_2OT}{|}}{CH}-CH_2-O\right)_v-R_5;\quad -CH_2-\overset{\overset{OT}{|}}{CH}-CH_2-R_5$$

and



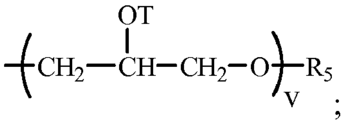
$$-\overset{\overset{CH_2OT}{|}}{CH}-CH_2-R_5$$

wherein each R_5 is independently selected from the group consisting of H, C_1-C_{32} alkyl, C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl, C_6-C_{32} alkylaryl, C_6-C_{32} substituted alkylaryl, -(CHR_6-CHR_6-O-)$_w$-L and a siloxyl residue;

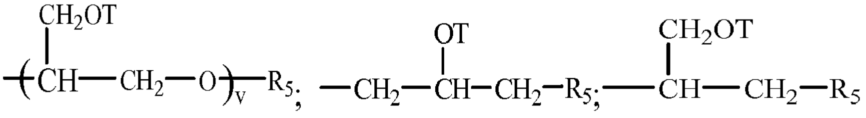
each R_6 is independently selected from H, C_1-C_{18} alkyl each L is independently selected from -C(O)-R_7 or R_7;

w is an integer from 0 to about 500, in one aspect w is an integer from about 1 to about 200; in one aspect w is an integer from about 1 to about 50;

each R_7 is selected independently from the group consisting of H; C_1-C_{32} alkyl; C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl, C_6-C_{32} alkylaryl; C_6-C_{32} substituted alkylaryl and a siloxyl residue;
each T is independently selected from H, and



$$-\left(CH_2-\overset{OT}{CH}-CH_2-O\right)_v-R_5\ ;$$



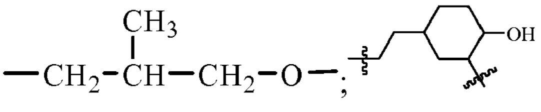
$$-\left(\overset{CH_2OT}{CH}-CH_2-O\right)_v-R_5;\quad -CH_2-\overset{OT}{CH}-CH_2-R_5;\quad -\overset{CH_2OT}{CH}-CH_2-R_5$$

and
wherein each v in said organosilicone is an integer from 1 to about 10, in one aspect, v is an integer from 1 to about 5 and the sum of all v indices in each Q in the said organosilicone is an integer from 1 to about 30 or from 1 to about 20 or even from 1 to about 10.

[0026] In another embodiment, the silicone may be chosen from a random or blocky organosilicone polymer having the following formula:

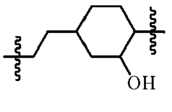
$$[R_1R_2R_3SiO_{1/2}]_{(j+2)}[(R_4Si(X\text{-}Z)O_{2/2}]_k[R_4R_4SiO_{2/2}]_m[R_4SiO_{3/2}]_j$$

wherein
j is an integer from 0 to about 98; in one aspect j is an integer from 0 to about 48; in one aspect, j is 0;
kis an integer from 0 to about 200; when k = 0, at least one of R_1, R_2 or R_3= -X-Z, in one aspect, k is an integer from 0 to about 50
m is an integer from 4 to about 5,000; in one aspect m is an integer from about 10 to about 4,000; in another aspect m is an integer from about 50 to about 2,000;
R_1, R_2 and R_3 are each independently selected from the group consisting of H, OH, C_1-C_{32} alkyl, C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl, C_6-C_{32} alkylaryl, C_6-C_{32} substituted alkylaryl, C_1-C_{32} alkoxy, C_1-C_{32} substituted alkoxy and X-Z;
each R_4 is independently selected from the group consisting of H, OH, C_1-C_{32} alkyl, C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl, C_6-C_{32} alkylaryl, C_6-C_{32} substituted alkylaryl, C_1-C_{32} alkoxy and C_1-C_{32} substituted alkoxy;
each X comprises of a substituted or unsubstituted divalent alkylene radical comprising 2-12 carbon atoms; in one aspect each X is independently selected from the group consisting of $-(CH_2)_s-O-$; $-CH_2-CH(OH)-CH_2-O-$;



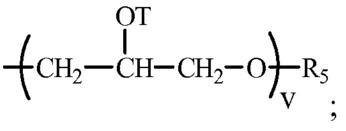
$$-CH_2-\overset{CH_3}{CH}-CH_2-O-;$$

and

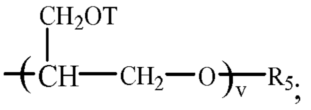


wherein each s independently is an integer from about 2 to about 8, in one aspect s is an integer from about 2 to about 4;

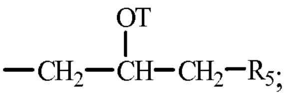
[0027] At least one Z in the said organosiloxane is selected from the group consisting of R_5;



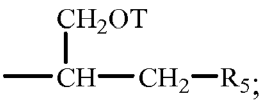
$-\left(CH_2-\overset{OT}{CH}-CH_2-O\right)_V-R_5$;



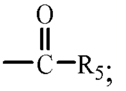
$-\left(\overset{CH_2OT}{CH}-CH_2-O\right)_V-R_5$;



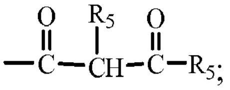
$-CH_2-\overset{OT}{CH}-CH_2-R_5$;



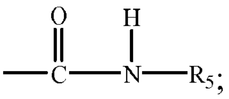
$-\overset{CH_2OT}{CH}-CH_2-R_5$;



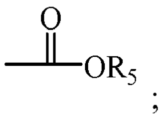
$-\overset{O}{\overset{\|}{C}}-R_5$;



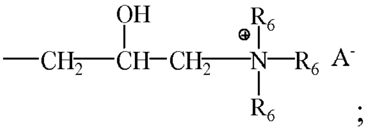
$-\overset{O}{\overset{\|}{C}}-\overset{R_5}{CH}-\overset{O}{\overset{\|}{C}}-R_5$;



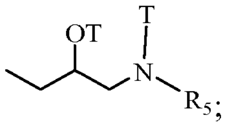
$-\overset{O}{\overset{\|}{C}}-\overset{H}{N}-R_5$;

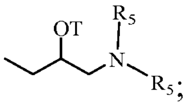


$-\overset{O}{\overset{\|}{C}}-OR_5$;



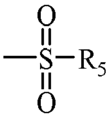
$-CH_2-\overset{OH}{CH}-CH_2-\underset{R_6}{\overset{R_6}{\overset{\oplus}{N}}}-R_6\ A^-$;





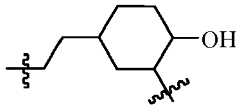
$-C(R_5)_2O-R_5$;

$-C(R_5)_2S-R_5$ and

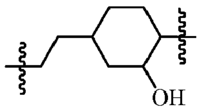


$-\underset{\underset{O}{\|}}{\overset{\overset{O}{\|}}{S}}-R_5$

provided that when X is

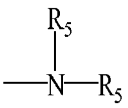


or



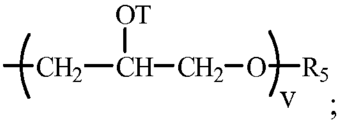
then

$Z = -OR_5$ or

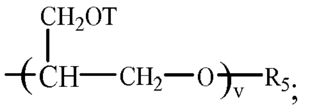


$-\overset{R_5}{N}-R_5$

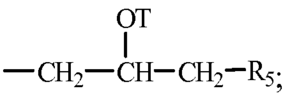
wherein A^- is a suitable charge balancing anion. In one aspect A^- is selected from the group consisting of Cl^-, Br^-, I^-, methylsulfate, toluene sulfonate, carboxylate and phosphate and each additional Z in said organosilicone is independently selected from the group comprising of H, C_1-C_{32} alkyl, C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl, C_6-C_{32} alkylaryl, C_6-C_{32} substituted alkylaryl, R_5,



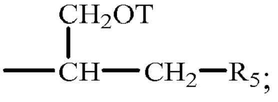
$-\left(CH_2-\overset{OT}{CH}-CH_2-O\right)_V-R_5$;



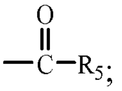
$-\left(\overset{CH_2OT}{CH}-CH_2-O\right)_V-R_5$;



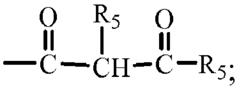
$-CH_2-\overset{OT}{CH}-CH_2-R_5$;



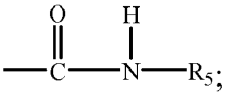
$-\mathrm{CH}(\mathrm{CH_2OT})-\mathrm{CH_2}-R_5$;



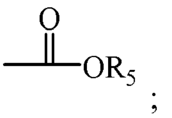
$-\mathrm{C}(=\mathrm{O})-R_5$;



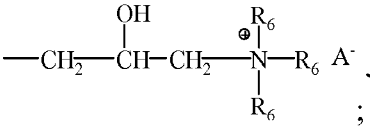
$-\mathrm{C}(=\mathrm{O})-\mathrm{CH}(R_5)-\mathrm{C}(=\mathrm{O})-R_5$;



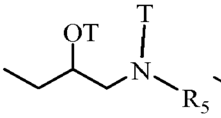
$-\mathrm{C}(=\mathrm{O})-\mathrm{N}(\mathrm{H})-R_5$;

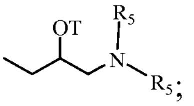


$-\mathrm{C}(=\mathrm{O})\mathrm{OR}_5$;



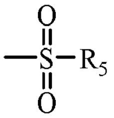
$-\mathrm{CH_2}-\mathrm{CH}(\mathrm{OH})-\mathrm{CH_2}-\overset{\oplus}{\mathrm{N}}(R_6)(R_6)-R_6\ A^-$;





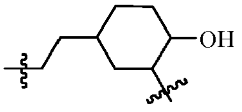
$-\mathrm{C}(R_5)_2\mathrm{O}-R_5$;

$-\mathrm{C}(R_5)_2\mathrm{S}-R_5$ and

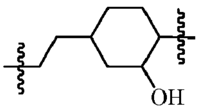


$-\mathrm{S}(=\mathrm{O})_2-R_5$

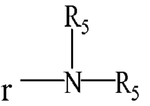
provided that when X is



or

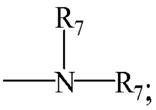


then

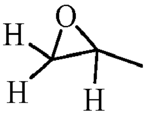


$Z = -\mathrm{OR}_5$ or $-\mathrm{N}(R_5)-R_5$

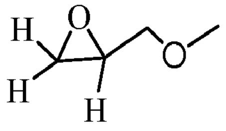
each R_5 is independently selected from the group consisting of H; C_1-C_{32} alkyl; C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl or C_6-C_{32} alkylaryl, or C_6-C_{32} substituted alkylaryl, $-(\mathrm{CHR_6}$-$\mathrm{CHR_6}$-$\mathrm{O}-)_w$-$\mathrm{CHR_6}$-$\mathrm{CHR_6}$-L and siloxyl residue wherein each L is independently selected from -O-C(O)-R_7 or -O-R_7;



$-\mathrm{N}(R_7)-R_7$;



and

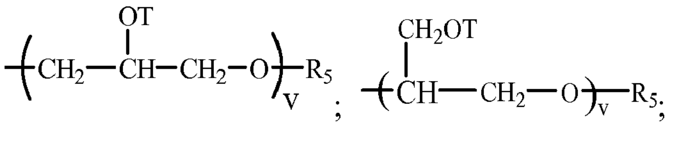


w is an integer from 0 to about 500, in one aspect w is an integer from 0 to about 200, one aspect w is an integer from 0 to about 50;

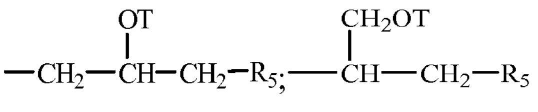
each R_6 is independently selected from H or C_1-C_{18} alkyl;

each R_7 is independently selected from the group consisting of H; C_1-C_{32} alkyl; C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl, C_6-C_{32} alkylaryl, and C_6-C_{32} substituted aryl, and a siloxyl residue;

each T is independently selected from H;



$$\left(CH_2-\overset{OT}{CH}-CH_2-O\right)_v-R_5\ ;\quad \left(\overset{CH_2OT}{CH}-CH_2-O\right)_v-R_5;$$



$$-CH_2-\overset{OT}{CH}-CH_2-R_5;\ -\overset{CH_2OT}{CH}-CH_2-R_5$$

wherein each v in said organosilicone is an integer from 1 to about 10, in one aspect, v is an integer from 1 to about 5 and the sum of all v indices in each Z in the said organosilicone is an integer from 1 to about 30 or from 1 to about 20 or even from 1 to about 10.

[0028] A suitable silicone is a blocky cationic organopolysiloxane having the formula:

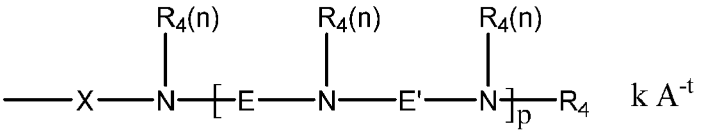
$M_wD_xT_yQ_z$
wherein:

$M = [SiR_1R_2R_3O_{1/2}]$, $[SiR_1R_2G_1O_{1/2}]$, $[SiR_1G_1G_2O_{1/2}]$, $[SiG_1G_2G_3O_{1/2}]$, or combinations thereof;
$D = [SiR_1R_2O_{2/2}]$, $[SiR_1G_1O_{2/2}]$, $[SiG_1G_2O_{2/2}]$ or combinations thereof;
$T = [SiR_1O_{3/2}]$, $[SiG_1O_{3/2}]$ or combinations thereof;
$Q = [SiO_{4/2}]$;

w = is an integer from 1 to (2+y+2z);
x = is an integer from 5 to 15,000;
y = is an integer from 0 to 98;
z = is an integer from 0 to 98;

R_1, R_2 and R_3 are each independently selected from the group consisting of H, OH, C_1-C_{32} alkyl, C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl, C_6-C_{32} alkylaryl, C_6-C_{32} substituted alkylaryl, C_1-C_{32} alkoxy, C_1-C_{32} substituted alkoxy, C_1-C_{32} alkylamino, and C_1-C_{32} substituted alkylamino;

at least one of M, D, or T incorporates at least one moiety G_1, G_2 or G_3; and G_1, G_2, and G_3 are each independently selected from the formula:



$$-X-\overset{R_4(n)}{N}-\left[E-\overset{R_4(n)}{N}-E'-\overset{R_4(n)}{N}\right]_p-R_4\qquad k\,A^{-t}$$

wherein:

X comprises a divalent radical selected from the group consisting of C_1-C_{32} alkylene, C_1-C_{32} substituted alkylene, C_5-C_{32} or C_6-C_{32} arylene, C_5-C_{32} or C_6-C_{32} substituted arylene, C_6-C_{32} arylalkylene, C_6-C_{32} substituted arylalkylene, C_1-C_{32} alkoxy, C_1-C_{32} substituted alkoxy, C_1-C_{32} alkyleneamino, C_1-C_{32} substituted alkyleneamino, ring-opened epoxide, and ring-opened glycidyl, with the proviso that if X does not comprise a repeating alkylene oxide moiety then X can further comprise a heteroatom selected from the group consisting of P, N and O;

each R_4 comprises identical or different monovalent radicals selected from the group consisting of H, C_1-C_{32} alkyl, C_1-C_{32} substituted alkyl, C_5-C_{32} or C_6-C_{32} aryl, C_5-C_{32} or C_6-C_{32} substituted aryl, C_6-C_{32} alkylaryl, and C_6-C_{32} substituted alkylaryl;

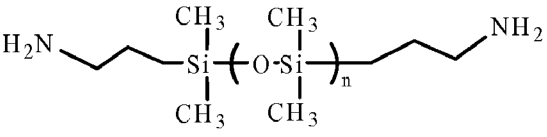
E comprises a divalent radical selected from the group consisting of C_1-C_{32} alkylene, C_1-C_{32} substituted alkylene, C_5-C_{32} or C_6-C_{32} arylene, C_5-C_{32} or C_6-C_{32} substituted arylene, C_6-C_{32} arylalkylene, C_6-C_{32} substituted arylalkylene, C_1-C_{32} alkoxy, C_1-C_{32} substituted alkoxy, C_1-C_{32} alkyleneamino, C_1-C_{32} substituted alkyleneamino, ring-opened epoxide and ring-opened glycidyl, with the proviso that if E does not comprise a repeating alkylene oxide moiety then E can further comprise a heteroatom selected from the group consisting of P, N, and O;

E' comprises a divalent radical selected from the group consisting of C_1-C_{32} alkylene, C_1-C_{32} substituted alkylene, C_5-C_{32} or C_6-C_{32} arylene, C_5-C_{32} or C_6-C_{32} substituted arylene, C_6-C_{32} arylalkylene, C_6-C_{32} substituted arylalkylene, C_1-C_{32} alkoxy, C_1-C_{32} substituted alkoxy, C_1-C_{32} alkyleneamino, C_1-C_{32} substituted alkyleneamino, ring-opened epoxide and ring-opened glycidyl, with the proviso that if E' does not comprise a repeating alkylene oxide moiety then E' can further comprise a heteroatom selected from the group consisting of P, N, and O;

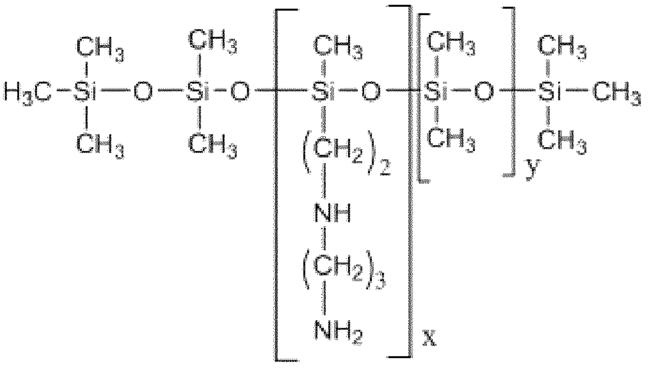
p is an integer independently selected from 1 to 50;
n is an integer independently selected from 1 or 2;

when at least one of G_1, G_2, or G_3 is positively charged, A^{-t} is a suitable charge balancing anion or anions such that the total charge, k, of the charge-balancing anion or anions is equal to and opposite from the net charge on the moiety G_1, G_2 or G_3; wherein t is an integer independently selected from 1, 2, or 3; and $k \le (p*2/t) + 1$; such that the total number of cationic charges balances the total number of anionic charges in the organopolysiloxane molecule; and wherein at least one E does not comprise an ethylene moiety.

[0029] Preferably, the silicone has a structure selected from:



wherein n is in the range of from 200 to 300;
or



wherein X is from 1 to 5, and wherein Y is from 200 to 700.

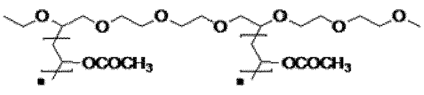
[0030] Fatty acid: Preferably, the fatty acid is C_{10}-C_{16} alkyl fatty acid. Preferably, the fatty acid has a melting point of at least 40°C, more preferably at least 50°C or even at least 60°C.

[0031] Preferably, the fatty acid has a pKa in the range of from 6 to 8.

[0032] Polymer: A suitable polymer is an alkoxylated polyethylene imine polymer having a weight average molecular weight in the range of from 300 Da to 1,000 Da, and wherein the polymer comprises an ethoxy and/or propoxy chain having from 12 to 36 alkoxy moieties.

[0033] Other suitable polymers are selected from polyethylene glycol and derivatives thereof, polyethyleneimine and derivatives thereof, polyvinyl pyrolidone and derivatives thereof, polyvinyl alcohol and derivatives thereof, cellulosic polymer, and any combination thereof.

[0034] Another suitable polymer has the structure



[0035] Other ingredients: The Detergent composition may comprise other ingredients. Suitable ingredients are selected from petrolatum and/or sensate. Suitable sensates are compounds that provide a cooling, warming, tingling or refreshing sensation, either through the endothermic or exothermic processes of physical lowering or raising of temperature; or through the physiological cooling process associated with, e.g., cold menthol receptor (TRPM8), or any other receptors generally located at or near nerve endings. Suitable sensates include menthol and derivatives thereof. Suitable menthol derivatives include menthyl lactate (available under the trade name Frescolat ML from Symrise GmbH & Co., Holzminden, Germany), menthol with a carboxamide derivative, menthol with a cyclohexanecarboxamide derivative, dimethyl menthyl succinimide, menthone glycerin acetal (available under the trade name Frescolat MGA from Symrise GmbH & Co., Holzminden, Germany), menthoxypropanediol (commercially available under the trade name Coolact 10 and Coolact P (-)-isopulegol from Takasago Int'l Corp., Tokyo, Japan); neoisomenthol, neomenthol, isomenthol, PMD 38 p-menthane-3,8,-diol, (2R)-3-(1-menthoxy)propane-1,2-diol, (2RS)-3-(1-menthoxy)propane-1,2-diol; N-ethyl-p-menthane-3-carboxamide (WS-3), ethyleneglycol p-menthane-3-carboxylate (WS-4), ethyl 3-(p-menthane-3-carboxamido)acetate (WS-5), N-(4-methoxyphenyl)-p-menthane-3-carboxamide (WS-12), N-t-butyl-p-menthane-carboxamide (WS-14),2-isopropyl-N-2,3-trimethylbutyramide (WS-23), 1-glyceryl p-menthane-3-carboxylate (WS-30) (all commercially available from Millennium Chemicals, Hunt Valley, MD, USA). Other suitable sensates include phenol derivatives, such as thymol and eugenol, Icilin (Phoenix Pharmaceuticals, Belmont, CA, USA), 2(5H)-MPF (Nestec, Vevey, Switzerland), 4-methyl-3-(1-pyrrolidinyl)2[5H]-furanone, MPD vanillyl acetal (Takasago Int'l Corp., Tokyo, Japan) Hotact VBE (Lipo Chemicals, Inc., Paterson, NJ, USA) and capsaicin (derivative of cayenne pepper).

[0036] Surfactant: Suitable surfactants include anionic surfactants, non-ionic surfactants, zwitterionic surfactants and amphoteric surfactants.

[0037] Suitable anionic detersive surfactants include sulphate and sulphonate detersive surfactants.

[0038] Suitable sulphonate detersive surfactants include alkyl benzene sulphonate, such as C_{10-13} alkyl benzene sulphonate. Suitable alkyl benzene sulphonate (LAS) is obtainable, or even obtained, by sulphonating commercially available linear alkyl benzene (LAB); suitable LAB includes low 2-phenyl LAB, such as those supplied by Sasol under the tradename Isochem® or those supplied by Petresa under the tradename Petrelab®, other suitable LAB include high 2-phenyl LAB, such as those supplied by Sasol under the tradename Hyblene®. Another suitable anionic detersive surfactant is alkyl benzene sulphonate that is obtained by DETAL catalyzed process, although other synthesis routes, such as HF, may also be suitable.

[0039] Suitable sulphate detersive surfactants include alkyl sulphate, such as C_{8-18} alkyl sulphate, or predominantly C_{12} alkyl sulphate. The alkyl sulphate may be derived from natural sources, such as coco and/or tallow. Alternative, the alkyl sulphate may be derived from synthetic sources such as C_{12-15} alkyl sulphate.

[0040] Another suitable sulphate detersive surfactant is alkyl alkoxylated sulphate, such as alkyl ethoxylated sulphate, or a C_{8-18} alkyl alkoxylated sulphate, or a C_{8-18} alkyl ethoxylated sulphate. The alkyl alkoxylated sulphate may have an average degree of alkoxylation of from 0.5 to 20, or from 0.5 to 10. The alkyl alkoxylated sulphate may be a C_{8-18} alkyl ethoxylated sulphate, typically having an average degree of ethoxylation of from 0.5 to 10, or from 0.5 to 7, or from 0.5 to 5 or from 0.5 to 3.

[0041] The alkyl sulphate, alkyl alkoxylated sulphate and alkyl benzene sulphonates may be linear or branched, substituted or un-substituted.

[0042] The anionic detersive surfactant may be a mid-chain branched anionic detersive surfactant, such as a mid-chain branched alkyl sulphate and/or a mid-chain branched alkyl benzene sulphonate. The mid-chain branches are typically C_{1-4} alkyl groups, such as methyl and/or ethyl groups.

[0043] Another suitable anionic detersive surfactant is alkyl ethoxy carboxylate.

[0044] The anionic detersive surfactants are typically present in their salt form, typically being complexed with a suitable cation. Suitable counter-ions include Na^+ and K^+.

Suitable non-ionic detersive surfactants are selected from the group consisting of: C_8-C_{18} alkyl ethoxylates, such as, NEODOL® non-ionic surfactants from Shell; C_6-C_{12} alkyl phenol alkoxylates wherein optionally the alkoxylate units are ethyleneoxy units, propyleneoxy units or a mixture thereof; C_{12}-C_{18} alcohol and C_6-C_{12} alkyl phenol condensates with ethylene oxide/propylene oxide block polymers such as Pluronic® from BASF; C_{14}-C_{22} mid-chain branched alcohols; C_{14}-C_{22} mid-chain branched alkyl alkoxylates, typically having an average degree of alkoxylation of from 1 to 30; alkylpolysaccharides, such as alkylpolyglycosides; polyhydroxy fatty acid amides; ether capped poly(oxyalkylated) alcohol surfactants; and mixtures thereof. Suitable nonionic detersive surfactants include secondary alcohol-based detersive surfactants. Other suitable non-ionic detersive surfactants include EO/PO block copolymer surfactants, such as the Plurafac® series of surfactants available from BASF, and sugar-derived surfactants such as alkyl N-methyl glucose amide.

[0045] Preferred surfactants include alkyl benzene sulphonate, alkyl ethoxylated sulphate, and mixtures thereof. Preferred surfactants include C_{10}-C_{13} alkyl benzene sulphonate, C_{12}-C_{15} alkyl ethoxylated sulphate having an everage degree of ethoxylation in the range of from 1.0 to 5.0 and mixtures thereof. Preferably the surfactant is an anionic surfactant having a cationic counter-ion selected from sodium or calcium. Preferably, the surfactant has a HLB in the range of from 30 to

[0046] Process for making a detergent composition: The process comprises the steps of:

(a) contacting a silicone with molten fatty acid to form a mixture of silicone and fatty acid;
(b) optionally, contacting the silicone with a detersive surfactant and/or perfume; and
(c) coating this mixture with a polymer to form a core-shell particle; and
(d) incorporating the core-shell particle formed in step (c) into a detergent composition. Preferably, the silicone is contacted with perfume prior to contacting the silicone with fatty acid. Preferably, the core is extruded prior to coating step (c).

Preferably, the fatty acid is cooled to a temperature below its melting point prior to step (c).

[0047] Step (a): The fatty acid and the silicone may be contacted at a temperature of at least 40°C, or even at least 70°C. Preferred heating means include hot water jacketing and/or hot oil jacketing. Other heating means include direct heat, electrical tracing, steam heating.

[0048] Suitable equipment for contacting the silicone to the fatty acid include mixers such as DPM range of high torque mixers from Charles Ross & Son Company, Hauppauge, New York.

[0049] Preferably, step (a) is carried out at a pH in the range of from 4.0 to 7.0, more preferably from 5.0 to 6.0. Preferably, step (a) is carried out at a pH that corresponds to, or is similar to, the pKa of the fatty acid. More preferably, step (a) is carried out at a pH no greater than 0.5 pH units above the pKa of the fatty acid, and no less than 0.5 pH units below the pKa of the fatty acid.

[0050] Optional step (b). Preferably, during this optional step (b), the mixture goes through a pressurized gun to form a solid particle.

[0051] Step (c). Preferably, the mixture is sprayed with a polymer. This can be carried out in a spray-drying tower.

[0052] Application of the detergent composition: The detergent composition can be incorporated into a variety of products, such as laundry detergent products, dish-washing detergent products, hard surface cleaning products, fabric enhancer products.

[0053] ClogP: The logP values of many perfume materials have been reported; for example, the Pomona92 database, available from Daylight Chemical Information Systems, Inc. (Daylight CIS, Irvine, California), contains many, along with citations to the original literature. However, the logP values are most conveniently calculated by the "CLOGP" program, also available from Daylight CIS. The "calculated logP" (ClogP) is determined by the fragment approach of Hansch and Leo (cf., A. Leo, in Comprehensive Medicinal Chemistry, Vol. 4, C. Hansch, P. G. Sammens, J. B. Taylor and C. A. Ramsden, Eds., p. 295, Pergamon Press, 1990). The fragment approach is based on the chemical structure of each perfume ingredient, and takes into account the numbers and types of atoms, the atom connectivity, and chemical bonding.

[0054] Boiling Point: The boiling point of perfume material is measured according to standard test method ASTM D2887-04a, "Standard Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography," (ASTM International, West Conshohocken, Pennsylvania, USA".

[0055] Melting Point: The Melting Point value is determined using the widely used standard Differential Scanning Calorimetry methodology described in the following published article: "Comprehensive Evaluation of the Melting Points of Fatty Acids and Esters Determined by Differential Scanning Calorimetry". J. Am. Oil Chem. Soc. (2009). 86:843-856A.

[0056] pKa: The pKa value is the negative log (base 10) of the acid dissociation constant. The acid dissociation constant, K_a, is the equilibrium constant for the acid-base dissociation reaction. The equilibrium of acid dissociation can be written symbolically as:

$$\mathrm{HA} \rightleftharpoons \mathrm{A}^- + \mathrm{H}^+$$

where HA is a generic acid that dissociates by splitting into A^-, known as the conjugate base of the acid, and the hydrogen ion or proton, H^+. The dissociation constant is usually written as a quotient of the equilibrium concentrations (in mol/L), denoted by [HA], $[A^-]$ and $[H^+]$:

$$K_a = \frac{[\mathrm{A}^-][\mathrm{H}^+]}{[\mathrm{HA}]}$$

[0057] The logarithmic constant, pK_a, which is equal to $-\log_{10} K_a$, is sometimes also referred to as an acid dissociation constant:

$$pK_a = -\log_{10} K_a$$

[0058] HLB: Hydrophilic-Lipophilic Balance (HLB) values are calculated according to the widely used standard methodology contained in the following published article: "The HLB System", 1987, ICI Americas Inc., Wilmington, Delaware, USA.

Method for measuring CatSO3:

Preparation indicator mixture (acidified solution):

[0059] The indicator mixture stock solution is made by dissolving 1g of Disulphine Blue and 2g of Dimidium Bromide in 50g of alcohol, and adding 447g of distilled water.

[0060] Once prepared the indicator mixture, then add 40 ml of indicator mixture-stock solution to a 2000 ml volumetric flask containing 200 ml of deionised water. Add 50 ml of sulphuric acid (2.5M), then add deionised water up to 2000 ml and assure appropriate mixing. The solution is stable for at least two months if stored in an amber bottle.

Titration Procedure:

[0061] Place a 100 ml glass nessler tube on the magnetic stirrer using a retort stand for support. Holding the nessler tube at an angle, place a magnetic stir bar into the tube. Place a piece of white paper between the plate and the stirrer. This will make the "end point" easier to identify. Dispense 10 ml of indicator mix (acidified solution) in to the nessler tube. Turn on the magnetic stirrer.

[0062] Dispense 10 ml of dichloromethane to the tube. Add 5 ml of sample solution to the tube. The layer of dichloromethane will turn red and the stirrer should be set so that this red layer is driven to the top of the solution. Titrate slowly until the red coloured layer disappears and the solution becomes a very pale grey.

[0063] **Method for measuring viscosity:** The viscosity is measured by the following method, which generally represents the zero-shear viscosity (or zero-rate viscosity). Viscosity measurements are made with an AR2000 Controlled-Stress Rheometer (TA Instruments, New Castle, Delaware, U.S.A.), and accompanying software version 5.7.0. The instrument is outfitted with a 40 mm stainless steel parallel plate (TA Instruments catalog no. 511400.901) and Peltier plate (TA Instruments catalog no. 533230.901). The calibration is done in accordance with manufacturer recommendations. A refrigerated, circulating water bath set to 25 °C is attached to the Peltier plate.

[0064] Measurements are made on the instrument with the following procedures: Conditioning Step (pre-condition the sample) under "Settings" label, initial temperature: 25 °C, pre-shear at 5.0 s^{-1} for 1 minute, equilibrate for 2 minutes; Flow-Step (measure viscosity) under "Test" Label, Test Type: "Steady State Flow", Ramp: "shear rate 1/s" from 0.001 s^{-1} and 1000 s^{-1}, Mode: "Log", Points per Decade: 15, Temperate: 25 °C, Percentage Tolerance: 5, Consecutive with Tolerance: 3, Maximum Point Time: 45 sec, Gap set to 1000 micrometers, Stress-Sweep Step is not checked; Post-Experiment Step under "Settings" label; Set temperature: 25 °C.

[0065] More than 1.25 ml of the test sample of the component to be measured is dispensed through a pipette on to the center of the Peltier plate. The 40 mm plate is slowly lowered to 1100 micrometers, and the excess sample is trimmed away from the edge of the plate with a rubber policeman trimming tool or equivalent. Lower the plate to 1000 micrometers (gap setting) prior to collecting the data.

[0066] Discard any data points collected with an applied rotor torque of less than 1 micro-N·m (e.g. discard data less than ten-fold the minimum torque specification). Create a plot of viscosity versus shear rate on a log-log scale. These plotted data points are analyzed in one of three ways to determine the viscosity value:

first, if the plot indicates that the sample is Newtonian, in that all viscosity values fall on a plateau within +/- 20% of the viscosity value measured closest to 1 micro-N·m, then the viscosity is determined by fitting the 'Newtonian' fit model in the software to all the remaining data;

second, if the plot reveals a plateau in which the viscosity does not change by +/- 20% at low shear rates and a sharp, nearly-linear decrease in viscosity in excess of the +/- 20% at higher shear rates, then the viscosity is determined by applying the "Best Fit Using Viscosity vs. Rate" option from the "Analysis Toolbar";

third, if the plot indicates that the sample is only shear-thinning, in that there is only a sharp, nearly-linear decrease in viscosity, then the material is characterized by a viscosity which is taken as the largest viscosity in the plotted data, generally a viscosity measured close to 1 micro-N·m of applied torque.

[0067] Report the average value of the replicates as the viscosity of the component, in units of Pa·s.

EXAMPLES

[0068] **EXAMPLE 1:** The following samples are prepared by the processes described below. Sample 2 is in accordance with the present invention. Sample 1 is a comparison example where the solid lipid particle is not coated with a polymer.

Ingredients	**Sample 1 Comparison example (no polymer)**	**Sample 2 In accordance with the present invention**
LAS flakes (92% active)	27.0 g	27.0 g
Dodecanoic acid	66.0 g	66.0 g
Silicone	7.0 g	7.0 g
Polymer	0.0 g	5.0 g

Process of making the samples:

[0069] **Process of making sample 1 (comparison example, no polymer):** 66.0g of dodecanoic acid is placed in a plastic container in an oven at 50°C (above its melting point of 43.2°C). A stirrer blade is warmed in the oven at 50 °C for at least one hour and then the blade is placed and locked in an overhead stirrer. 7.0g of silicone (PDMS) is added to the overhead stirrer and the mixture is stirred at 50°C at 1000rpm for 5 minutes. 27.0g LAS flakes are added and the mixture stirred at 50°C, 350rpm for 5 minutes to form a homogeneous mixture. This mixture is placed in a pressurized gun to form small extruded solid partilces of 100 to 200 microns.

[0070] **Process of making sample 2 (in accordance with the present invention):** 66.0g of dodecanoic acid is placed in a plastic container in an oven at 50°C (above its melting point of 43.2°C). A stirrer blade is warmed in the oven at 50 °C for at least one hour and then the blade is placed and locked in an overhead stirrer. 7.0g of silicone (PDMS) is added to the overhead stirrer and the mixture is stirred at 50°C at 1000rpm for 5 minutes. 27.0g LAS flakes are added and the mixture stirred at 50°C, 350rpm for 5 minutes to form a homogeneous mixture. This mixture is placed in a pressurized gun to form small extruded solid partilces of 100 to 200 microns. The solid lipid particles are coated with 5g of a polymer via spray-drying equipment.

[0071] **Test protocol:** Each of the above described samples 1 and 2 were tested for matrix compatibility in a heavy duty liquid products.

Compatibility test protocol:

[0072] The samples were added into a laundry detergent (Ariel UK liquid laundry detergent). We have measured the release of anionic surfactant in the matrix as increase of the CatSO3% versus the reference which is the Ariel UK liquid laundry detergent:

	CatSO3% vs Reference
Sample 1	+7
Sample 2	0

[0073] Sample 2 (in accordance with the present invention) shows no difference in the surfactant concentration after 1 week of storage in the matrix product, instead sample 1 shows an increase of 7% in the CatSO3 suggesting a dissolution of the particles, which indicates a poor stability profile.

[0074] The samples were added into a laundry detergent (Ariel UK Water-soluble unit dose laundry detergent). We have measured the volume (V_T) occupied by the particles as the volume of the single particle multiplied by the number of particles ($N * V_n$) over 1 week time.

	V_T (time 0 h)	V_T (time 150 hours)
Sample 1	13	1.0
Sample 2	13	6.0

[0075] Sample 2 (in accordance with the present invention) shows a smaller reduction of V_T than Sample 1. This suggests that Sample 2 has a superior compatibility with the matrix since the coating protects direct interaction between the core and the matrix within which is suspended, therefore we observe a smaller reduction of V_T.

Example 2: Illustrative applications of the detergent composition.

[0076] Solid free-flowing particulate laundry detergent composition examples:

Ingredient	**Amount (in wt%)**
Core-shell particle of the present invention (e.g. sample 2)	from 3wt% to 30wt%
Anionic detersive surfactant (such as alkyl benzene sulphonate, alkyl ethoxylated sulphate and mixtures thereof)	from 8wt% to 15wt%
Non-ionic detersive surfactant (such as alkyl ethoxylated alcohol)	from 0.5wt% to 4wt%
Cationic detersive surfactant (such as quaternary ammonium compounds)	from 0 to 4wt%
Other detersive surfactant (such as zwiterionic detersive surfactants, amphoteric surfactants and mixtures thereof)	from 0wt% to 4wt%
Carboxylate polymer (such as co-polymers of maleic acid and acrylic acid	from 1wt% to 4wt%
Polyethylene glycol polymer (such as a polyethylene glycol polymer comprising polyvinyl acetate side chains)	from 0.5wt% to 4wt%
Polyester soil release polymer (such as Repel-o-tex and/or Texcare polymers)	from 0.1 to 2wt%
Cellulosic polymer (such as carboxymethyl cellulose, methyl cellulose and combinations thereof)	from 0.5wt% to 2wt%
Other polymer (such as care polymers)	from 0wt% to 4wt%
Zeolite builder and phosphate builder (such as zeolite 4A and/or sodium tripolyphosphate)	from 0wt% to 4wt%
Other co-builder (such as sodium citrate and/or citric acid)	from 0wt% to 3wt%
Carbonate salt (such as sodium carbonate and/or sodium bicarbonate)	from 0wt% to 15wt%
Silicate salt (such as sodium silicate)	from 0wt% to 10wt%
Filler (such as sodium sulphate and/or bio-fillers)	from 10wt% to 50wt%
Source of hydrogen peroxide (such as sodium percarbonate)	from 0wt% to 20wt%
Bleach activator (such as tetraacetylethylene diamine (TAED) and/or nonanoyloxybenzenesulphonate (NOBS))	from 0wt% to 8wt%
Bleach catalyst (such as oxaziridinium-based bleach catalyst and/or transition metal bleach catalyst)	from 0wt% to 0.1wt%
Other bleach (such as reducing bleach and/or preformed peracid)	from 0wt% to 10wt%
Photobleach (such as zinc and/or aluminium sulphonated phthalocyanine)	from 0wt% to 0.1wt%

(continued)

Ingredient	Amount (in wt%)
Chelant (such as ethylenediamine-N'N'-disuccinic acid (EDDS) and/or hydroxyethane diphosphonic acid (HEDP))	from 0.2wt% to 1wt%
Hueing agent (such as direct violet 9, 66, 99, acid red 50, solvent violet 13 and any combination thereof)	from 0wt% to 1wt%
Brightener (C.I. fluorescent brightener 260 or C.I. fluorescent brightener 351)	from 0.1wt% to 0.4wt%
Protease (such as Savinase, Savinase Ultra, Purafect, FN3, FN4 and any combination thereof)	from 0.1wt% to 0.4wt%
Amylase (such as Termamyl, Termamyl ultra, Natalase, Optisize, Stainzyme, Stainzyme Plus and any combination thereof)	from 0.05wt% to 0.2wt%
Cellulase (such as Carezyme and/or Celluclean)	from 0.05wt% to 0.2wt%
Lipase (such as Lipex, Lipolex, Lipoclean and any combination thereof)	from 0.1 to 1wt%
Other enzyme (such as xyloglucanase, cutinase, pectate lyase, mannanase, bleaching enzyme)	from 0wt% to 2wt%
Fabric softener (such as montmorillonite clay and/or polydimethylsiloxane (PDMS))	
Flocculant (such as polyethylene oxide)	from 0wt% to 1wt%
Suds suppressor (such as silicone and/or fatty acid)	from 0wt% to 0.1wt%
Perfume (such as perfume microcapsule, spray-on perfume, starch encapsulated perfume accords, perfume loaded zeolite, and any combination thereof)	from 0.1wt% to 1wt%
Aesthetics (such as coloured soap rings and/or coloured speckles/noodles)	from 0wt% to 1wt%
Miscellaneous	Balance

[0077] Liquid Fabric Enhancer composition:

Finished Product Material Chemical Name	Ingredient Function	Liquid Fabric Enhancer w/w%
Core shell particle of the present invention (e.g. sample 2)	Softener	From 3 to 10.00
Perfume microcapsules	Perfume encapsulate	0.77
acetoacetamide	Formaldehyde Scavenger	0.04
NaHEDP	Stabilizer/Chelant	0.04
Formic acid	Acidulant	0.03
CaCl2 34%	Rheology modifier	0.02
HCl 25%	Acidulant	0.03
Proxel GXL	Preservative	0.04
MP 10 antifoam	Suds suppressor	0.10
Dye	Dye	0.28
Perfume	Perfume	0.54

(continued)

Finished Product Material Chemical Name	Ingredient Function	Liquid Fabric Enhancer w/w%
Rheovis CDE	Rheology modifier	0.15
DI water	Dilutant	Balance
	TOTAL	100.00

[0078] Liquid Laundry Detergent composition:

	(wt%)
AE3S[4]	2.6
Alkyl benzene sulfonate [3]	7.5
Sodium formate/Calcium formate	0.4
Sodium hydroxide	3.7
Monoethanolamine (MEA)	0.3
Diethylene glycol (DEG)	0.8
AE9[6]	0.4
AE7[5]	4.4
Polyetheramine[11]	----
Chelant[7]	0.3
Citric Acid	3.2
C_{12-18} Fatty Acid	3.1
Ethanol	2.0
Ethoxylated Polyethylenimine [1]	1.5
Amphiphilic polymer [2]	0.5
Core shell particle of the present invention (e.g. sample 2)	3-10
1,2-Propanediol	3.9
Protease (40.6 mg active/g)[9]	0.6
Amylase: Stainzvme® (15 mg active/g)[8]	0.2
Fluorescent Whitening Agents[10]	0.1
Water, perfume, dyes & other components	Balance

1. Polyethyleneimine (MW = 600) with 20 ethoxylate groups per -NH.
2. Random graft copolymer is a polyvinyl acetate grafted polyethylene oxide copolymer having a polyethylene oxide backbone and multiple polyvinyl acetate side chains. The molecular weight of the polyethylene oxide backbone is about 6000 and the weight ratio of the polyethylene oxide to polyvinyl acetate is about 40 to 60 and no more than 1 grafting point per 50 ethylene oxide units.
3. Linear alkylbenzenesulfonate having an average aliphatic carbon chain length C_{11}-C_{12} supplied by Stepan, Northfield, Illinois, USA
4. AE3S is C_{12-15} alkyl ethoxy (3) sulfate supplied by Stepan, Northfield, Illinois,USA
5. AE7 is C_{12-15} alcohol ethoxylate, with an average degree of ethoxylation of 7, supplied by Huntsman, Salt Lake City, Utah, USA
6. AE9 is C_{12-13} alcohol ethoxylate, with an average degree of ethoxylation of 9, supplied by Huntsman, Salt Lake City, Utah, USA
7. Suitable chelants are, for example, diethylenetetraamine pentaacetic acid (DTPA) supplied by Dow Chemical,

Midland, Michigan, USA or Hydroxyethane di phosphonate (HEDP) supplied by Solutia, St Louis, Missouri, USA Bagsvaerd, Denmark

8. Savinase®, Natalase®, Stainzyme®, Lipex®, Celluclean™, Mannaway® and Whitezyme® are all products of Novozymes, Bagsvaerd, Denmark.

9. Proteases may be supplied by Genencor International, Palo Alto, California, USA (e.g. Purafect Prime®) or by Novozymes, Bagsvaerd, Denmark (e.g. Liquanase®, Coronase®).

10. Suitable Fluorescent Whitening Agents are for example, Tinopal® AMS, Tinopal® CBS-X, Sulphonated zinc phthalocyanine Ciba Specialty Chemicals, Basel, Switzerland

11. Polyetheramine of Example 1, 1 mol 2-Butyl-2-ethyl-1,3-propane diol + 4 mol propylene oxide/OH, aminated.

[0079] Water-soluble unit dose laundry detergent pouch composition:

	3 compartments			2 compartments		3 compartments		
Compartment #	1	2	3	1	2	1	2	3
Dosage (g)	34.0	3.5	3.5	30.0	5.0	25.0	1.5	4.0
Ingredients	Weight %							
Alkylbenzene sulfonic acid	20.0	20.0	20.0	10.0	20.0	20.0		
Alkyl sulfate				2.0				
C12-14 alkyl 7-ethoxylate	17.0	17.0	17.0		17.0	17.0		
Cationic surfactant				1.0				
Zeolite A				10.0				
C12-18 Fatty acid	13.0	13.0	13.0		18.0	18.0		
Sodium acetate				4.0				
Enzymes	0-3	0-3	0-3	0-3		0-3		
Sodium Percarbonate				11.0				
TAED				4.0				
Organic catalyst[1]				1.0				
PAP granule[2]								50
Polycarboxylate				1.0				
Core shell particle of the present invention (e.g. sample 2)			From 3 to 10		From 3 to 10	From 3 to 10		
Hydroxyethane diphosphonic acid	0.6	0.6	0.6	0.5				
Ethylene diamine tetra(methylene phosphonic) acid						0.4		
Brightener	0.2	0.2	0.2	0.3		0.3		
Alkoxylated polyamine[6]	5.0				4.0	7.0		
Hueing dye [4]			0.05		0.035		0.12	
Perfume	1.7	1.7		0.6		1.5		
Water	10.0	10.0	From 7 to 0		4.1	1.0		
Glycerol	5.0					6.0	10.0	
Sorbitol					1			
Propane diol	5.0	5.0	5.0		From 27 to 20	From 8 to 1	89.0	

(continued)

	3 compartments	2 compartments	3 compartments
Buffers (sodium	To pH 8.0 for liquids		
carbonate, monoethanolamine)[5]	To RA > 5.0 for powders		
Minors (antioxidant, aesthetics,...), sodium sulfate for powders	To 100%		

Claims

1. A detergent composition comprising a core-shell particle, wherein the core-shell particle comprises a core, wherein the core comprises at least 50% by weight of the core of a mixture of silicone and fatty acid, wherein the core-shell particle comprise a shell, wherein the shell comprises at least 66% by weight of the shell of a polymer.

2. A composition according to claim 1, wherein the core-shell particle comprises from 90wt% to 98wt% core and from 2wt% to 10wt% shell.

3. A composition according to any preceding claim, wherein the weight ratio of fatty acid to silicone present in the core is in the range of from 5:1 to 15:1.

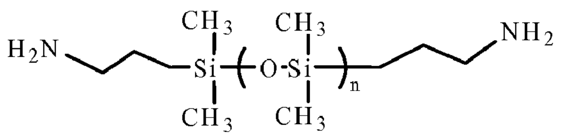
4. A composition according to any preceding claim, wherein the core-shell particle comprises at least 10% by weight of the core of detersive surfactant.

5. A composition according to claim 4, wherein the detersive surfactant is selected from alkyl benzene sulphonate, alkyl alkoxylated alcohol, alkyl alkoxylated sulphate, polyoxyethylene sorbitan monooleate and any combination thereof.

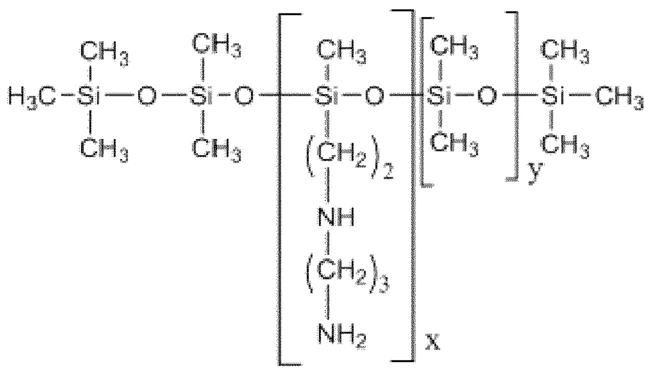
6. A composition according to claim 5, wherein the detersive surfactant is a C_{12}-C_{16} alkyl ethoxylated alcohol having an average degree of ethoxylation of from 3 to 7.

7. A composition according to any preceding claim, wherein the fatty acid is C_{10}-C_{16} alkyl fatty acid.

8. A composition according to any preceding claim, wherein the silicone has a structure selected from:



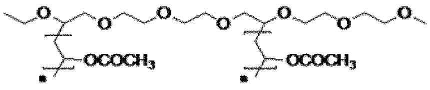
wherein n is in the range of from 200 to 300; or



wherein X is from 1 to 5, and wherein Y is from 200 to 700.

9. A composition according to any preceding claim, wherein the polymer is selected from polyethylene glycol and derivatives thereof, polyethyleneimine and derivatives thereof, polyvinyl pyrolidone and derivatives thereof, polyvinyl alcohol and derivatives thereof, cellulosic polymer, and any combination thereof.

10. A composition according to claim 8, wherein the polymer has the structure:



11. A composition according to claim 9, wherein the polymer has an alkoxylated polyethylene imine polymer having a weight average molecular weight in the range of from 300 Da to 1,000 Da, and wherein the polymer comprises an ethoxy and/or propoxy chain having from 12 to 36 alkoxy moieties.

12. A composition according to any preceding claim, wherein the core comprises at least 5% by weight of the core of perfume.

13. A composition according to any preceding claim, wherein the composition is a laundry detergent powder, wherein the laundry detergent powder comprises from 3wt% to 30wt% core-shell particle and from 33wt% to 97wt% detergent particle, and optionally wherein the detergent particle comprises a polymer which has the same chemical structure as the polymer comprised in the shell of the core-shell particle.

14. A composition according to any preceding, wherein the composition is a liquid laundry detergent composition, wherein the liquid laundry detergent composition comprises from 3wt% to 10wt% core-shell particle and from 90wt% to 97wt% liquid detergent matrix, wherein the core-shell particle is suspended within a continuous phase of liquid detergent matrix, and wherein the liquid detergent matrix comprises at least 1% by weight of the liquid detergent matrix of a polymer which has the same chemical structure as the polymer comprised in the shell of the core-shell particle, and optionally wherein the liquid detergent matrix comprises less than 30% by weight of the liquid detergent matrix of water.

15. A composition according to any preceding claim, wherein the composition is a water-soluble unit dose laundry detergent pouch.

16. A water-soluble unit dose laundry detergent pouch according to claim 15, wherein the laundry detergent pouch comprising at least two separate compartments, wherein the first compartment comprises the core-shell particle, and wherein the first compartment has a pH in the range of from 3.0 to 7.0, and wherein the second compartment comprises a detergent ingredient, and wherein the second compartment has a pH in the range of from greater than 7.0 to 12.0.

17. A water-soluble laundry detergent pouch according to claim 16, wherein the first compartment has a pH in the range of from 4.0 to 6.0, and wherein the second compartment has a pH in the range of from greater than 7.0 to 11.0.

18. A water-soluble laundry detergent pouch according to any preceding claim, wherein the first compartment comprises from 15% to 25% by weight of the core surfactant and from 2% to 5% of the polymer present in the first compartment, of the core-shell particle, and wherein the second compartment comprises from 15% to 35% of surfactant, from 50% to 70% of fatty amphiphile and polymer coating from 2% to 10% by weight of ingredients present in the second compartment.

19. A process of making a composition according to any preceding claim, wherein the process comprises the steps of:

(a) contacting a silicone with molten fatty acid to form a mixture of silicone and fatty acid;
(b) optionally contacting the silicone with a detersive surfactant and/or perfume; and
(c) coating this mixture with a polymer to form a core-shell particle; and
(d) incorporating the core-shell particle formed in step (c) into a detergent composition.

20. A process according to claim 19, wherein silicone is contacted with perfume prior to contacting the silicone with fatty acid.

21. A process according to claim 19, wherein the core is extruded prior to coating step (c).

22. A process according to claim 19, wherein the fatty acid is cooled to a temperature below its melting point prior to step (c).

Europäisches
Patentamt
European
Patent Office
Office européen
des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 15 18 5687

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2011/127030 A1 (PROCTER & GAMBLE [US]; SMETS JOHAN [BE]; FERNANDEZ PRIETO SUSANA [ES];) 13 October 2011 (2011-10-13) * claims 1, 4-6, 15; examples; table 4 * -----	1-22	INV. C11D3/37 C11D17/00 C11D17/04 C11D3/20 ADD. C11D3/00 C11D17/06
A	US 6 656 975 B1 (CHRISTIANO STEVEN PATRICK [US] ET AL) 2 December 2003 (2003-12-02) * claims 1, 2, 5, 11, 12; examples 17, 19, 20 * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			C11D

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
The Hague	19 February 2016	Loiselet-Taisne, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
....
& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 15 18 5687

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-02-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011127030 A1	13-10-2011	CN 102811699 A	05-12-2012
		EP 2555742 A1	13-02-2013
		US 2011245136 A1	06-10-2011
		WO 2011127030 A1	13-10-2011
US 6656975 B1	02-12-2003	AT 444112 T	15-10-2009
		AU 2003241532 A1	12-12-2003
		BR 0304937 A	28-09-2004
		CN 1665577 A	07-09-2005
		DK 1509304 T3	02-11-2009
		EP 1509304 A1	02-03-2005
		JP 4619776 B2	26-01-2011
		JP 2005525931 A	02-09-2005
		KR 20050004854 A	12-01-2005
		US 6656975 B1	02-12-2003
		WO 03099413 A1	04-12-2003

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- EP 1479378 A **[0005]**
- WO 2012089474 A **[0006]**
- WO 2011116962 A **[0007]**

Non-patent literature cited in the description

- **A. LEO.** Comprehensive Medicinal Chemistry. Pergamon Press, 1990, vol. 4, 295 **[0053]**
- Comprehensive Evaluation of the Melting Points of Fatty Acids and Esters Determined by Differential Scanning Calorimetry. *J. Am. Oil Chem. Soc.,* 2009, vol. 86, 843-856A **[0055]**
- The HLB System. ICI Americas Inc, 1987 **[0058]**